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MISCELLANEA MEGADRILOGICA

VII. GREENHOUSE EARTHWORMS

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Records of earthworms from artificial environments of North America are few and widely scattered through taxonomic publications of the last seventy years. The present note brings together the more interesting of previously published greenhouse records and such new ones as have accumulated during recent years. Collecting in central Maine for exercise and recreation during tenure of a John Simon Guggenheim Fellowship was continued for the same reasons while the author was engaged in research financed by the Rockefeller Foundation and by the National Science Foundation.

In the listings beyond, the convention of three figures following the date of collection refers to the numbers of juvenile, acitellate, and clitellate specimens, respectively.

LUMBRICIDAE

Fifteen species of this family now are known (*cf.* Gates, 1961) from central Maine. One was secured, during a period of more than a dozen years, only in greenhouses. Eleven were found indoors as well as outside and one of them is of sufficient interest in the present connection to warrant inclusion of all outdoor records for central Maine.

*Allolobophora* Eisen, 1874

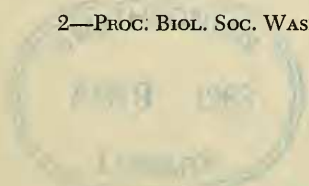
*Allolobophora chlorotica* (Savigny, 1826)

Bangor, Maine

Sunnyside Greenhouses, in hard packed soil above stiff clay floor under plant benches, 5 November, 1-6-6, 28 February, 3-3-4. In outside plant beds, 5 November, 0-2-1, 18-20 April, 2-1-16, 9 May, 3-0-6. Bare area probably covered during previous fall and winter with a pile of leaves, 13 May, 10-6-24. (Several years' samplings.)

Lougee-Frederick Greenhouses, in soil under plant benches, 25 November, 0-0-1.

Seavey Greenhouses, in soil under plant benches, 13 December, 0-1-0.



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City dump, among matted leaves, 28 October, 1-1-2.

Roadside ditch, among leaves of previous year, 19 October, 2-0-0.  
Gerald Kinney.

Ellsworth, Maine

Clark Greenhouses, in soil under plant benches, 24 March, 4-0-14.

Corinna, Maine

Garden, soil with stiff clay and ashes, 27 November, 0-4-1. Gerald Kinney.

Newport, Maine

Maple leaves, 7 May, 1-0-3. C. L. Kinney.

Marblehead, Massachusetts

Brown's Greenhouses, in undisturbed soil under plant benches, 27 February, 24-7-13. G. W. McKey.

Ardasley, New York

Wilson Greenhouses, in earth under plant benches, 7 August, 0-0-5.

The original home of the species is unknown but probably is somewhere in Europe below the southern limit of Pleistocene glaciation.

After more than 12 years of collecting in central Maine the writer suspects that *A. chlorotica* goes out of the greenhouses more often than it comes inside.

*Eisenia* Malm, 1877

*Eisenia hortensis* (Michaelsen, 1890)

Bangor, Maine

Bangor Floral Company, in soil under plant benches of greenhouses, 7 March, 0-0-9.

Bar Harbor, Maine

Conservatory of Reef Point Gardens, in undisturbed soil beneath a pot under a plant bench, 24 July, 0-0-1.

Ardasley, New York

In compost of hot bed with temperature of 80-85°F, October, 0-4-5.  
Carl Deuber per Libbie Hyman. April, 0-0-3. Carl Deuber.

*Eisenia hortensis* was previously recorded from natural habitats in Urbana (Illinois), San Francisco (California), and McMinnville (Oregon). The single record for Ohio is of a clitellate specimen found in a Cleveland toilet bowl! The original home of the species is believed to be in some portion of Eurasia that was not covered by the Pleistocene glaciers.

ACANTHODRILIDAE

*Microscolex* Rosa, 1887

Excepting two widely distributed peregrine forms little is known about this unrevised classical genus.

*Microcolex phosphoreus* (Duges, 1837)

Bangor, Maine

Sunnyside Greenhouses, in soil under plant benches, 28 February, 0-0-2.

Bangor Floral Company, in soil under plant benches in greenhouses, 7 March, 0-0-1.

Devil's Lake, North Dakota

From greenhouse soil, 2-0-3. W. J. Colberg per P. W. Oman.

*M. phosphoreus* was erected in 1837 on specimens from a greenhouse of the Jardin des Plantes at Montpellier, France, and has been reported from greenhouses in Germany (Berlin and Hamburg) as well as from soil of a plant plot in a private apartment at Poznan, Poland, and of a pot brought prior to 1900 from Honolulu to San Francisco. Outdoors in North America the species has been recorded from Washington, D. C., North Carolina, Florida, Louisiana and California.

*M. phosphoreus* long was believed to be native to southern France but later on was thought to have come originally from Australia, New Zealand or southern South America.

The only previous record of an oligochaete from the state of North Dakota was of the exotic *Eisenia foetida* (Savigny, 1826) and the site from which the specimens were obtained also was artificial.

## OCTOCHAETIDAE

*Dichogaster* Beddard, 1888*Dichogaster bolau* (Michaelsen, 1891)

Belle Glade, Florida

Under ten-gallon jars on concrete floor (presumably in a greenhouse), 15 May 1956, 1-0-10. D. S. Questel per U. S. Dept. Agriculture.

*D. bolau* was erected on specimens from warm, fermenting bark at a tannery in Bergedorf, Germany, and in 1895 was found in the orchid house of Golden Gate Park, San Francisco. Though not uncommon in Mexico, Panama, Haiti, Jamaica, Dominica, St. Vincent, and Trinidad, the species has not been found outdoors on the mainland north of the Mexican border. The original home of *D. bolau* has been thought to be in equatorial Africa.

## MEGASCOLECIDAE

*Pheretima* Kinberg, 1867

The area of endemicity is from eastern Burma and the Andaman Islands through Japan, from Korea and China through Sumatra, Java, New Guinea. Nine of the 17 species (for key *cf.* Gates, 1958) recorded from the western hemisphere have been found in artificial environments.

*Pheretima agrestis* (Goto & Hatai, 1899)

*P. agrestis* has been reported from culture beds in the aquarium building at the Bronx Zoo, New York City, from a florist's nursery in Albany

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(New York) and from natural environments at Boston (Massachusetts), Greenwich (Connecticut), Rye and Schenectady (New York), and Shreveport (Louisiana). At Boston the species was found in an arboretum. The original home of *agrestis* is in Japan.

### *Pheretima bicincta* (Perrier, 1875)

Bangor, Maine

Bangor Floral Company, in soil under plant benches of greenhouses, 22 December, 11-12, 7 January, 8-2-8, 7 March, 0-2-3.

Bar Harbor, Maine

Browning Greenhouses, in soil under plant benches, 25 May, 1-1-1.

*P. bicincta* had not previously been reported from mainlands of American continents, but has been recorded from Trinidad, Grenada, St. Thomas, India, Burma (only from earth with potted plants), Penang, Taiwan, Java, Philippine Republic, and the Caroline Islands. The original home of the species is unknown but presumably is to be sought in the region from Java to the Philippines.

### *Pheretima californica* Kinberg, 1867

This species, erected on specimens from San Francisco, has been recorded from a Vassar College greenhouse at Poughkeepsie (New York) and from natural North American habitats in Louisiana, Arkansas, and California. The original home of *californica* may be in China.

### *Pheretima diffringens* (Baird, 1869)

Bangor, Maine

Bangor Floral Company, from earth of plant benches in greenhouses, 14 October, 0-0-3. In soil under plant benches, 7 January, 5-1-5, 7 March, 0-2-1.

Bangor Nursery, from earth of plant benches, 20 October, 0-0-2.

Lougee-Frederick Greenhouses, in soil under plant benches, 25-26 November, 0-0-2.

Ellsworth, Maine

Clark Greenhouses, in soil under plant benches, 24 March, (10?)-10-5.

Bar Harbor, Maine

Dorrance Greenhouses, in soil under plant benches, 25 May, 0-3-2.

Malvern Flower Shop, in soil under plant benches of greenhouses, 25 May, 0-1-1.

West Brooksville, Maine

David's Folly Earthworm Farm, from culture bed in cellar of residence, 21 July 1956, 0-0-1. Gerald Kinney.

*P. diffringens* was erected in 1869 on specimens from an orchid bed in a "plant stove" at Plas Machynlleth, North Wales, but had been present in a hot house at Bury St. Edmunds (Suffolk, England) at least since 1849.

The species was recorded subsequently from greenhouses in Scotland, Denmark, Germany, Poland, Russia, France, Italy, Urbana and Chicago (Illinois), Dayton (Oregon), and was first reported from Australia in earth of pots with plants distributed by a Sydney nursery to which the worms were thought to have been brought from Mauritius. Outdoors in North America and Europe the species has been recorded from Connecticut, New York, Virginia, North Carolina, Georgia, Alabama, Florida, Mississippi, Louisiana, Texas, Arkansas, Nebraska (from soil in vicinity of greenhouses at Lincoln), California, Mexico, Costa Rica, Guatemala, and from gardens around greenhouses in France, Italy and Portugal. Although escapes and evictions from British greenhouses must have been numerous during a period of more than a hundred years, domicile apparently has never been acquired. Introduction to California was prior to 1852 and to Florida and Georgia before 1894. The original home of the species probably is in China.

In Scotland, *diffringens* was found only in greenhouses kept at a temperature of 60° or more.

The superstructure of a Maine greenhouse in which *diffringens* lives was destroyed by fire in 1947. Subsequent introduction of the species from outside the town, according to the gardener in charge, was impossible.

*Pheretima hawayana* (Rosa, 1891)  
Bangor, Maine

Bangor Floral Company, in soil under plant benches in greenhouses, 7 January, 0-1-0, 7 March, 0-0-5.

Ellsworth, Maine

Clark Greenhouses, in soil under plant benches, 24 March, 1-0-0.

Chatham, New Jersey

Greenhouses, August 1954, 0-4-9. Harold Davies.

*P. hawayana*, erected on specimens from Hawaii, was reported previously from greenhouses in St. Petersburg (Russia), Poznan (Poland), France, England, Uruguay, Chicago, Evanston, Pana and Urbana (Illinois), Nashville (Tennessee), Hadley (Massachusetts) and Dayton (Oregon). Outdoors in North America (no records for Europe) the species has been recorded from Alabama, Florida, Louisiana and California. The original home of *hawayana* may be in China.

*Pheretima hupeiensis* (Michaelsen, 1892)  
Orono, Maine

University of Maine, in earth with rocks under plant benches of greenhouses, 25 October, 5-2-2-1, 18 June, 1-3-2.

Greenwich, Connecticut

Saxon-Krueger Greenhouses, in soil under plant benches, 26 August 1957, 0-4-0.

## Ithaca, New York

Old soil dumped outside a greenhouse, 28 October 1960, 0-2-3. David Pimentel.

*P. hupeiensis* was recorded previously from a greenhouse in Beltsville (Maryland), from golf courses at Stamford (Connecticut), Rye and Pelham (New York), Catonsville (Maryland), and from other outdoor habitats in New York City, Philadelphia (Pennsylvania), Washington (D. C.), New Orleans and other but unspecified localities in Louisiana. Louisville (Kentucky) and Chattanooga (Tennessee) now can be added to the list. There are no records for rural sites.

Although already common at Washington in 1910, the species for some time seemingly attracted little attention to itself. Its casting habits by 1948 had become so much of a nuisance in enough places to stimulate golfers to finance the research that revealed methods of exterminating earthworms in the greens. Memoranda, privately circulated as the funds were being raised, indicated that the "Oriental earthworm" was distributed along the Atlantic seaboard "to a depth" from western Connecticut into Florida. Confirmation of the supposed "massive infestation of scores of country clubs" has not yet been obtained.

The original home of the species probably is in China but *hupeiensis* has been recorded from Japan and specimens from southern South America may have been mistakenly referred to another but quite different species.

*Pheretima levis* (Goto & Hatai, 1899)

*P. levis* was previously recorded from culture beds in the aquarium building of the Bronx Zoo at New York City, and from a presumably natural habitat at Schenectady (New York). The species is known elsewhere only from Japan which is its original home.

*Pheretima morrisi* (Beddard, 1892)

Bangor, Maine

Seavey Greenhouses, in soil under plant benches, 13 December, 5-5-4-1.

*P. morrisi* was previously recorded from greenhouses in England, Poughkeepsie (New York) and from natural habitats of the continental United States, in Florida, Louisiana and Texas. The original home of the species may be in China.

*Pheretima rodericensis* (Grube, 1879)

Orono, Maine

University of Maine, in earth with rocks under plant benches of greenhouses, 25 October, 1-2-6, 18 June, (9?)-3-3.

Bar Harbor, Maine

Browning Greenhouses, in soil under plant benches, 25 May, 1-0-3.  
*P. rodericensis* was reported previously from greenhouses in Russia,



Germany, Poland, Czechoslovakia, Switzerland, France, England, and from natural American habitats in Florida. Elsewhere, the species has been found in Puerto Rico, Bermuda, Grenada, Martinique, Dominica, Trinidad, British, French and Dutch Guiana, South Africa, Comores, Rodriguez, Mauritius, Madagascar, Nossi Be, Christmas Island, and New Caledonia. The latter island may be near the unknown original home of *rodericensis*.

*Pheretima* sp.  
Bangor, Maine

Bangor Floral Company, in soil under plant benches of greenhouses, 7 March, 8-0-0 and two posterior fragments of larger specimens.

#### GLOSSOSCOLECIDAE

The area of endemicity, as the family now is defined (*cf.* Gates, 1959, p. 255), comprises tropical South America, Central America, and the West Indies.

*Pontoscolex* Schmarda, 1861

The area of endemicity seemingly includes Central America, perhaps along with a small northern portion of South America, but very little is known about the genus.

*Pontoscolex corethrurus* (Müller, 1857)

*P. corethrurus* was reported previously from greenhouses at Pana (Illinois), Chatham (New Jersey), and Berlin (Germany). At Chatham the worms were brought inside from a bank of soil (behind the greenhouses) where they had been living at least from 1937 to 1947. Several attempts to get more recent information about the outdoor colony were unsuccessful.

Presence of the species in a golf green of a New Jersey Country Club was indicated by information available to B. T. Thompson, technical director of an insecticide company, who supplied data regarding activities at the Chatham site.

#### EUDRILIDAE

*Eudrilus* Perrier, 1871

*Eudrilus eugeniae* (Kinberg, 1867)

This species, originally from equatorial Africa but now with a pantropical distribution, has not been reported from greenhouses. In equally artificial environments, culture beds of earthworm farms (often indoors), *E. eugeniae* has been raised for sale in various northern states and even in Canada. Mr. Baker, who initiated commercial culture of the species, says (*in lit.*) that he has shipped it to every state including Hawaii (where it was fed to a platypus). In spite of a continuous and wide distribution for 15 years, *eugeniae* has not yet been recorded from a natural habitat on the American mainland north of Panama. That statement is, however, of little

significance because of the gaps in our knowledge of the earthworm faunas of the continent.

#### DISCUSSION AND SUMMARY

Earthworms from 12 sets of greenhouses and from one conservatory in central Maine belonged to 19 species, eight of which were not found outside. Indoor species, one to five of them in a single set of greenhouses, were represented by 194 of 900+ specimens. Five individuals of *P. diffringens* were found in the earth of plant benches, the other 189 specimens of indoor species in undisturbed soil, mainly under the plant benches. Most worms of other species were secured from earth in plant benches. Digging in the benches often was restricted or inadvisable. Hence, indoor species may have been above the ground level more often than the records show.

The fauna of no Maine greenhouse was restricted to indoor species. Eight of the 12 lumbricid species inhabiting Maine greenhouses probably are often brought inside, in cocoons or after hatching, with soil, manure, or compost. Direction of movement, for three lumbricid species, now seems likely to be more often in the reverse direction, from the greenhouses to the outside world. One lumbricid and the seven species of other families must have been introduced, at least originally, in earth with potted plants from outside the state of Maine. One of the pheretimas probably had been in its greenhouse for more than 12 years. Earth from the plant benches often is discarded at more or less regular intervals. Presumably, then, individuals of indoor species were evicted on many occasions during the last 50 or more years from their sheltered environment. The colonies of *P. corethrurus* and *P. hupeiensis* outside New Jersey and New York greenhouses probably were initiated in just that way. Nevertheless, none of the inside species has been able to establish itself in natural Maine environments. Presumably, then, the Maine climate, like that of Denmark, Germany, Poland and Russia, is unfavorable. One factor that may be of considerable importance is temperature. Supporting evidence is provided by the out-of-doors colonizations of pheretimas in states with milder climates. However, the climate of England would seem, at least to the layman, to be milder than that of central Maine. Yet domicile for more than a century in British greenhouses has resulted, so far as can be determined from the literature, in no outside colonizations such as are recorded for France, Italy and Portugal.

Greenhouses, in certain parts of the world, have provided centers for introduction and local distribution of exotic earthworms from China, Japan, the southern hemisphere and the tropics. As yet, only the more obvious instances have been recognized. Much remains to be learned about the role of man in modifying local earthworm faunas throughout the world.

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